

# 4

## Specification & Performance Verification

### 4.1 Specifications: CW and Signal Generators

#### 4.1.1 CW Operation

Frequency Ranges	Model
10 MHz to 8 GHz	2408L/2408AL/2408M/2408AM
10 MHz to 20 GHz	2420L/2420AL/2420M/2420AM
10 MHz to 26.5 GHz	2426L/2426AL/2426M/2426AM
10 MHz to 40 GHz	2440L/2440AL/2440M/2440AM

#### 4.1.1.1 Frequency Bands

Band	Frequency	N
0	10 - 15.99 MHz	512
1	16 - 30.99 MHz	256
2	31 - 62.99 MHz	128
3	63 - 124.99 MHz	64
4	125 - 249.99 MHz	32
5	250 - 499.99 MHz	16
6	500 - 999.99 MHz	8
7	1.0 - 1.99 GHz	4
8	2.0 - 3.99 GHz	2
9	4.0 - 7.99 GHz	1

Band	Frequency	N
10	8.0 - 15.99 GHz	1/2
11	16.0 - 31.99 GHz	1/4
12	32.0 - 40.00 GHz	1/8

#### 4.1.1.2 Resolution

0.1 Hz

#### 4.1.1.3 Accuracy & Stability (Identical to Timebase Oscillator)

4.1.1.3.1 Timebase (Internal)	10 MHz
4.1.1.3.2 Aging Rate (after 30 minutes warm up time)	< $5 \times 10^{-10}$ /day, 2400L and 2400M Series only < $1 \times 10^{-8}$ /day. 2400A Series only
4.1.1.3.3 Temperature Stability	$\pm 5 \times 10^{-10}$ /°C, 2400L and 2400M Series only $\pm 2 \times 10^{-8}$ /°C, 2400A Series only
4.1.1.3.4 10 MHz Reference Output	TTL into 50 $\Omega$
4.1.1.3.5 External Reference Input	10 MHz or 100 MHz $\pm 1$ ppm > -5 dBm into 50 $\Omega$

### 4.1.2 RF Output Power

#### 4.1.2.1 Maximum Levelled Output<sup>2,3</sup> (0 to 35°C)

Frequency Range (GHz)	.01 - 8 GHz	8 - 20 GHz	20 -40 GHz <sup>4</sup>
20 GHz Model	+16	+15	
26.5 GHz Model	+13	+9	+10
40 GHz Model	+13	+9	+9

<sup>2</sup>Specification applies over the 0 to 35°C range and degrades <2.0 dB from 35 to 55°C.

<sup>3</sup>Step attenuator (option 26) reduces power by 1.5 dB to 20 GHz and 2.0 dB above 20 GHz

<sup>4</sup>20 - 26.5 GHz for model 2426

**4.1.2.2 Minimum Settable**

-20 dBm  
-110 dBm (option 26)

**4.1.2.3 Resolution**

0.05 dB

**4.1.2.4 Accuracy<sup>5</sup> (dB)**

Frequency (GHz)	> 5 dBm	> - 20 dBm	> -110 dBm
.01 - 20 GHz	± 1.0	± 0.8	± 1.3
.01 - 40 GHz	± 1.2	± 1.0	± 1.5

<sup>5</sup>Specifications applies over the 15 to 35°C range and degrades <0.5 dB outside that range.

**4.1.2.5 Power Offset**

0 to 10 dB

**4.1.2.6 Temperature Stability**

0.025 dB/°C

**4.1.2.7 Source Match (typical)**

<2.0:1

**4.1.2.8 RF Connector Type**

Model	Connector Type
2408L	N (f)
2420/2426	SMA (f)
2440	K (f)

### 4.1.3 Spectral Purity

#### 4.1.3.1 Harmonics<sup>6</sup>

(Power out = + 6 dBm)

Frequency (GHz)	Harmonic (dBc)
0.01 to 2 GHz <sup>7</sup>	- 50 dBc
2 to 20 GHz	- 55 dBc
20 to 40 GHz	- 30 dBc

<sup>6</sup> Specifications for harmonics above instrument frequency range are typical.

<sup>7</sup> Specification is - 30 dBc below 100 MHz.

#### 4.1.3.2 Subharmonics

(Power out = + 6 dBm)

Frequency (GHz)	Harmonic (dBc)
0.01 to 2 GHz	- 80 dBc
2 to 20 GHz	- 60 dBc
20 to 40 GHz	- 50 dBc

A sub-harmonic is defined as any  $\frac{1}{4}$ ,  $\frac{1}{2}$ , or  $\frac{3}{4}$  multiple of the fundamental RF Output

#### 4.1.3.3 Spurious<sup>8</sup>

(Offsets > 300 Hz)

Frequency (GHz)	Non Harmonics (Offsets > 300 Hz)
0.01 to 16 GHz	- 60 dBc
16 to 32 GHz	- 54 dBc
32 to 40 GHz	- 48 dBc

<sup>8</sup> Specification is - 45 dBc typical for offsets < 300 Hz.

**4.1.3.4 Residual FM (typical)**

Frequency (GHz)	50 Hz - 15 KHz Bandwidth
0.01 to 16 GHz	< 40 Hz
16 to 32 GHz	< 80 Hz
32 to 40 GHz	< 120 Hz

**4.1.3.5 AM Noise (typical)**

Frequency (GHz)	Offsets > 5 MHz
0.01 to 2 GHz	-130 dBm/Hz
2 to 20 GHz	-145 dBm/Hz
20 to 40 GHz	-140 dBm/Hz

4.1.3.6 Single-Sideband Phase Noise

(dBc/Hz, CW mode, all power levels)

Frequency Range (GHz)	Offset From Carrier				
	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
0.85	-92	-111	-112	-123	-130
1.85	-86	-105	-106	-117	-135
5.6	-75	-97	-98	-105	-130
10	-74	-92	-92	-101	-128
18	-68	-89	-90	-99	-123
23	-63	-85	-86	-93	-118
30	-61	-83	-84	-91	-115